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NEW PERSPECTIVE ARTICLE:

# Importance of Assessing the Impact of Combined Lifestyle Factors Related to Periodontitis in Costa Ricans

## La importancia de evaluar el impacto de la combinación de factores de estilos de vida relacionados con la periodontitis en costarricenses

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ABSTRACT: Periodontal disease is an infectious and inflammatory disease, which is characterized by the destruction of tooth supporting tissues: root cementum, periodontal ligament and alveolar bone. Dental biofilm or plaque is the etiological risk factor for gum disease. There are a variety of risk factors that may contribute the onset and progression of periodontitis. Modifiable risk factors are habituated risk factors that can be changed by adjusting behavioral attitudes. These adjustments minimize the possibility of chronic disease occurrence. Thus, it becomes important, to identify individual modifiable factors such as lifestyle factors, which could influence the severity and higher risk of progression of periodontitis. Diet, physical activity, stress levels, sleep quality, smoking, and alcohol consumption, in relation to periodontal disease have been studied individually. Little is known about the combined effect of these health-related lifestyle patterns related to health and periodontal status. Studying the combination of lifestyle factors is recommended to establish an adequate management and treatment plan of patients with periodontitis. Costa Ricans present a unique pattern of sociodemographic, ethnic, cultural diversity, and lifestyle factors. Assessing these variables in different populations are a priority, to prevent and treat chronic diseases, such as periodontitis.

KEYWORDS: Alcohol; Diet; Health-related lifestyles; Lifestyle factors; Physical activity; Sleep quality; Smoking; Stress; Periodontitis.

RESUMEN: La enfermedad periodontal es una enfermedad infecciosa e inflamatoria, que se caracteriza por la destrucción de los tejidos de soporte del diente: cemento radicular, ligamento periodontal y hueso alveolar. El biofilm dental o placa es el factor de riesgo etiológico de la enfermedad de las encías. Existe una variedad de factores de riesgo que pueden contribuir a la aparición y progresión de la periodontitis. Los factores de riesgo modificables son factores de riesgo habituales que pueden cambiarse ajustando las actitudes conductuales. Estos ajustes, minimizan la posibilidad de que se produzcan enfermedades crónicas. Por lo tanto, resulta importante identificar factores modificables individuales, como los factores de estilo de vida, que podrían influir en la gravedad y el mayor riesgo de progresión de la periodontitis. Se han estudiado individualmente la dieta, la actividad física, los niveles de estrés, la calidad del sueño, el tabaquismo y el consumo de alcohol, en relación con la enfermedad periodontal. Se sabe poco, sobre el efecto combinado de estos patrones de estilo de vida relacionados con la salud y el estado periodontal. Se recomienda estudiar la combinación de factores del estilo de vida para establecer un adecuado plan de manejo y tratamiento de los pacientes con periodontitis. Los costarricenses presentan un patrón único de factores sociodemográficos, étnicos, de diversidad cultural y de estilos de vida. Evaluar estas variables en diferentes poblaciones, son una prioridad para prevenir y tratar enfermedades crónicas, como la periodontitis.

PALABRAS CLAVE Alcohol; Dieta; Estilo de vida relacionado con la salud; Factores de estilos de vida; Actividad física; Calidad de sueño; Fumado; Estrés; Periodontitis.

An epidemiological study published in 2017, that compiled the periodontal status of the care centers of the Costa Rican Social Security Fund, reported that the prevalence of periodontal disease was of 35.36% (CI 35.07-35.66) (1). The researchers described that the prevalence was of 59.10% (CI 58.58-59.63%) in the 20-45 years age group. While in the elderly, the prevalence was of 40.64% (CI 39.61-41.67). To date, research studies on the periodontal status of Costa Ricans are scarce. Furthermore, there are no studies assessing risk factors for periodontitis in the Costa Rican population. It becomes essential to investigate modifiable risk factors such as health-related lifestyle factors to prevent and treat chronic diseases, including periodontitis.

Lifestyle factors are modifiable habits or behaviors of an individual that can have repercussions on general health and even diseases of the oral cavity. In recent years, healthy lifestyles have attracted increasing attention due to their potential benefits for general well-being. For example, a healthy lifestyle pattern may be one in which the person does not smoke, has moderate or intense physical activity (three hours or more times per week), a high-quality diet, moderate alcohol consumption ( or women it means an intake of 5 to 15 g/day or 5 to 30 g/day for men), and having a normal weight with a body mass index between 18.5 to 24.9 (2). Likewise, unhealthy lifestyles have attracted concern, as they could be risk factors related to chronic diseases and conditions. Unhealthy lifestyles are related to non-communicable diseases, which account for around 63% of all deaths worldwide (3).

Currently, research has focused on associating healthy lifestyle patterns and systemic diseases. To illustrate, it has been documented that the combination of healthy lifestyles is associated with longer life expectancy, better cognitive function and lower prevalence of cardiovascular diseases (4, 5). Consequently, in recent years, there has

been increased interest in evaluating the benefit of following a healthier lifestyle to avoid the development of morbidities. Since periodontitis is a chronic systemic disease, a potential link may be found between healthy lifestyles and periodontitis prevention. Healthy lifestyles for the prevention and treatment of periodontitis are often neglected. Modifying lifestyle factors may be an affordable method for preventing and treating periodontitis consequences. Therefore, more research is required to ascertain the connection between periodontitis and a thorough assessment of lifestyle factors.

The adverse effects of unhealthy lifestyles on systemic health can be mainly attributed to the induction of a state of chronic or low-grade inflammation and the overproduction of reactive oxygen species, which cause oxidative stress (6). Since the state of low-grade inflammation has been related to periodontitis in a bidirectional manner (7), the association between lifestyle behaviors and periodontitis need to be further analyzed. Investigations have reported a greater prevalence and severity of periodontal disease in people with behaviors related to an unhealthy lifestyle (8-13). On these premises, unhealthy lifestyles can also negatively influence the effectiveness of Steps 1 and 2 of periodontal therapy (14). Although the association of each lifestyle factor and periodontitis has already been studied, little is known about the combined effect of modifiable lifestyle factors related to periodontal status. As far as we know, no study has been carried to develop a comprehensive lifestyle risk scoring system based on Costa Ricans' lifestyle risk factors and periodontitis as a combined concept.

The anti-inflammatory properties of the Mediterranean diet were associated with a lower incidence and prevalence of periodontitis (11). Additionally, consumption of certain foods provides nutrients with antioxidant and immunomodulatory effects that participate in bone metabolism, which could particularly prevent periodontal disease advancement and benefit clinical outcomes of periodontal therapy. Diets high in sugar increase oxidative stress and induce proinflammatory cytokines. There are mechanisms in which the biofilm converts the sugar present in the oral cavity into short-chain carboxylic acids, which promote gingival inflammation. On this line, further research is needed to investigate the effect of diet quality in larger cohorts. In Costa Rica, the Mediterranean diet is not followed commonly. Future research on Costa Rica's' typical diet, could have implications to inform about dietary recommendations to promote periodontal health. To consider, during the past 20 years, the quality of diet of Costa Rican adolescents has evolved. Nowadays, adolescents consume fewer dietary products, vegetables, beans, and dietary fiber (15). Conversely, they report drinking sugary drinks, pastries, desserts, snacks, fast foods and total added sugars. Current trends in diet quality of Costa Rican adolescents may place them at a higher risk for major chronic diseases, including periodontal disease.

Even though causality has not been established, physical activity may positively impact periodontal disease, by reducing inflammatory biomarkers. Moderate physical activity improves insulin sensitivity, reduces the incidence of obesity, bone density, and reduces levels of stress. A recent study reported that one third of a representative sample of Costa Rica's urban population, did not follow the international recommendations for physical activity established by the World Health Organization (16). Major findings were that male participants spent more time doing physical activity than women, younger participants were more active than older individuals, and individuals with a healthy weight exercised more than overweight (16). Lack of physical activity is a modifiable risk factor for different diseases. Hence, there is a

need for longitudinal cohort studies to related how physical activity influences periodontitis and periodontal treatment outcomes.

Research suggests that chronic stress and poor coping strategies may play a role in the risk and development of periodontitis. Proposed mechanisms aim to clarify how stress affects periodontal health. Stress seems to indirectly impact periodontal health by promoting unhealthy behaviors, including smoking, excessive alcohol use, drug abuse, poor diet, neglecting oral hygiene, and inadequate dental care compliance. Additionally, stress may directly affect periodontal health through biological changes, such as alterations in saliva, modifications in gingival blood flow, and effects on the host immune response. A patient's mental health can impact their dental hygiene. Stress can lead to inadequate oral care, resulting in plaque buildup and, over time, increasing the risk of gingivitis and periodontitis. Studies on the relationship between stress and periodontitis in Costa Ricans are pending. Specifically, it would be important to evaluate trait and state anxiety related to periodontal disease.

In recent years, an increase in inadequate sleep has been reported among the worldwide population, due to the reduction in the quality and quantity of sleep. Inadequate sleep causes a weaker immune system by increasing inflammatory and proinflammatory markers, which may have a potential influence in inflammation and oxidative stress. Sleep is an essential biological process and of utmost importance for all the body's defense mechanisms. It has been reported that patients with poor quality sleep have a higher risk of presenting periodontitis than those who do not present any type of sleep disorder (17). Poor sleep quality and short sleep time have been associated with the severity and progression rate of periodontal disease. Periodontitis causes systemic inflammation which could affect the quality and quantity of sleep, just as short sleep time has an inducing effect on systemic inflammation which may influence the development of the disease, presenting a possible bidirectional cycle.

Smoking is considered one of the most predominant risk factors for the onset, severity and progression rate of periodontitis and its response to treatment. Smoking is related to a specific colonization pattern of periodontal pathogens and species, as well as increases of oxidative stress. Also, it is related to an overproduction of cytokines, which has a destructive effect on periodontal tissues. Smoking suppresses the immune system by altering the function of neutrophils, the production of antibodies, the activity of fibroblasts and the production of vascular factors and inflammatory mediators, causing an increase in the prevalence of periodontitis. Heavy smokers have a higher risk of developing periodontitis compared to moderate/light smokers and non-smokers.

Recent studies from our group, have evidenced that most patients who attended the Clinic of Periodontics of the University of Costa Rica for periodontal treatment, reported being non-smokers. Costa Rica's General Law on Tobacco Control and its Harmful Effects on Health, No. 9028, which prohibits smoking in public areas, may explain this. It is against the law to smoke or vape in public areas. In addition, the prevalence and consumption of tobacco cigarettes have decreased recently in Costa Rica because of extensive anti-smoking programs.

Finally, alcoholic patients that consume heavy quantities of alcohol, have an increased risk of periodontitis and tooth loss (18). Excessive alcohol consumption induces an overproduction of cytokines and causes an imbalance in the host's immunity. Patients who have chronic heavy alcohol consumption have a greater quantity of red and orange complex microorganisms compared to non-alcoholic patients (18). Of note, a recent study (19) evidenced that 37 of 100 individuals between the ages of 20 to 29 years consume alcohol in

Costa Rica. Alcohol is the main psychoactive product Costa Ricans consume. Still, there are no studies of the effects of alcohol consumption on Costa Ricans' oral health.

Periodontal disease can be prevented and treated. Treatment consists of removing dental plaque, supragingival and subgingival calculus, as well as controlling the risk factors associated with the disease. As stated, lifestyle behaviors are modifiable. The relationship between lifestyle factors and the periodontal state has mostly been assessed in North America and Europe. This is a research subject that can be further explored in Costa Ricans with and without periodontitis. Costa Ricans present a unique pattern of sociodemographic, ethnic, cultural diversity, and lifestyle factors. Assessing these variables is a priority to prevent and treat chronic diseases, such as periodontal disease and conditions.

## AUTHOR CONTRIBUTION STATEMENT

Conceptualization and design: K.R.
Literature review: M.F.R.C. and K.R.
Writing-original draft preparation: K.R.
Writing-review & editing: M.F.R.C. and K.R.
Supervision: K.R.

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